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(54) Title: GROWING MEDIUM

(57) Abstract

A growing medium of mineral fibres and a granulated expanded mineral comprising more than or equal to 30 % by weight of granulated dried clay and from 0.01 to 10 % by weight of a binder.

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Growing Medium

The present invention relates to a growing medium containing mineral fibres and granulated expanded mineral secured in a three-dimensional matrix with cured binder.

In the growing of potted plants today sphagnum or peat-based plant growing media are the ones most commonly used. In some cases mineral soil-based products are also used which, following a pretreatment, have become suitable for plant growing purposes. It is a characteristic feature of these products that they hold from 70 to 80 % by volume of water at total water saturation (water capacity at 0 cm suction pressure) and from 10 to 25 % by volume of air (air capacity), contents considered ideal basis for the growing of plants.

The organic and natural origin of sphagnum or peat products for the growing of potted plants results in considerable variations in the individual sources and within the individual source at the expense of product uniformity. A further known inconvenience associated with said products is their propensity to contain weed seeds and plant pathogenic organisms, such as fungus zoo-spores and larvae of fungus gnat and scarid fly which, in certain conditions, may cause considerable production loss.

Sphagnum or peat-based products necessarily undergo biological conversion and decomposition processes when used as plant growing media. Such decomposition deprives the products of any lasting structural stability and therefore cultivation control problems (pH and conductivity control as well as watering control) are often encountered.

The cultivation control problems associated with sphagnum or peat-based products are therefore particularly obvious in case of crops requiring a protracted cultivation period and in unstable weather conditions where the fertilizer and water dosage must be adapted to the needs of the crop.

It is a further drawback of the sphagnum and peat-based growing media that, due to the decomposition of the growing medium when used

in the growing of potted plants, the medium collapses in the pot. The resulting increase in its water saturation and thus the reduction in its air capacity (reduced oxygen pressure) may provide the environment required for fungus diseases to cause root rot in the crop, thereby incurring production losses.

Bøvre, O. (1990) (Dyrkningssubstrater. Måling af vand- og luftforhold. Grøn viden, (~Growth Substrates. Measurement of Water and Air Conditions. Green Knowledge) No. 51, discloses that even good sphagnum loses 4-6% of its air capacity after 60 days at 12°C. It is further stated that a suitable growing medium should have an air capacity of at least 15% and 20% of readily available water throughout the medium.

The collapse in sphagnum or peat-based products may, depending on the origin of the materials and the cultivation period of the plants, result in a reduction of as much as 30-40% of its physical volume at the start of the cultivation, without the total water content and the water available in the growing medium being reduced accordingly.

Today's estimates say that probably up to 8% of the total production of potted plants is lost due the above disadvantageous properties of the growing media currently in use.

Mineral fiber-containing growing media are not yet commonly used in the growing of greenhouse potted plants due to the insufficient water retention and cationic exchange properties that characterize the mineral fibre products used as plant growing media. Plants grown in a mineral fibre matrix of purely mineral fibres will have low transportation tolerance as they require stable and accurate supplies of water and fertilizer, and thus the retail prospects for potted plants grown in purely mineral fibres to be sold to the average consumer are very restricted.

DE 40 17 334 A1 discloses a substrate for potted plants comprising 90-95% of granulated lava, pumice or burnt clay having a particle size of from 2 to 6 mm admixed with water penetration inhibiting mineral fibres and a swellable copolymer. The mineral fibres are

constituted of comminuted rock wool in an amount of from 4% to 9%. It is stated that the medium provides an optimum oxygen supply for the plant roots and that the rock wool fibres impart homogeneity to the medium.

It is often preferred in the production of composite growing media to admix the components used immediately prior to the mixture being filled into pots or containers as the mixture will separate during its transportation from producer to consumer. In this admixing process it often occurs that the components are further comminuted and consequently the structural and water retention properties of the admixture are modified. Furthermore, comminuted or granulated rock wool in admixture with said materials will separate in a container even after a short growing period according to their respective volume weights so that the heaviest components and those with the highest water content will collect on the bottom of the growing container and the lightest components will concentrate at the top. Thereby the product homogeneity and structure is lost.

EP,A1,350132 discloses an agro-plug for the germination of seeds and for transplantation and it consists of a homogeneous mixture of mineral wool and an inorganic soil comprising a mixture of clay, silt and sand. The agro-plug is produced from an aqueous slurry composed of the various components and a flocculant so that a homogeneous mixture is precipitated. The volume weight of the agro-plug is comprised between 250 and 1100 kg/m$^3$, preferably between 500 and 850 kg/m$^3$.

Growing media having a volume weight in their dry condition of more than 250-300 kg/m$^3$ is unsuitable for the growing of potted plants, and the production of growing media from aqueous slurries are energy intensive and thus associated with relatively high costs.

EP 156 786 A2 discloses a growing element comprising a mass of particles wherein the particles are bound to each other in a limited number of contact points. The particles may i.a. be expanded perlite, expanded vermiculite or expanded clay, optionally in admixture with mineral fibres. The fibres are bound with gelling water-absorbent polyacrylamide. To enhance the polymerisation of polyacrylamide

up to 10% of bentonite may be used.

The use of expanded minerals and mineral fibres as the most essential component of a plant growing medium results in a low cation exchange capacity (CEC), the CEC of these components being less than about 1 meq/100 g. The addition of up to 10% of bentonite as a polymerisation agent for the polyacrylamide gel will not contribute to an increase of the CEC, the bentonite being bound in the gel.

It is the object of the invention to provide a plant growing medium of the kind described in the introductory part which is characterized in having high structural stability, lasting optimum air capacity, good water retention and cation exchange capacities and which may also be reproduced as a uniform plant growing medium.

This object is achieved with the growing medium according to the invention which growing medium is characterized in comprising more than or equal to 30 % by weight of dried granulated clay and from 0.01 to 10 % by weight of binder.

The growing medium according to the invention may be produced by admixing granulated mineral fibre material, optionally comprising a binder, with uncured binder and optionally anionic tenside and the additive in a mixer before the mixture is shaped or collected on a conveyor belt and cured. According to an alternative embodiment, the mineral fibres are mixed with the additive by the latter being blown into a mineral fibre flow simultaneously with or immediately following its formation by the throwing off of fibres from a spinning wheel and the addition of uncured binder and optionally anionic tenside.

Concurrently with its being heated in the hardening furnace, the mixture of mineral fibre, uncured binder and additives may optionally be exposed to mechanical compression to obtain the desired volume weight. In case of a hydrophobic mineral fibre material a surface-active agent (a tenside) may be added.

The advantage asssociated with curing the mineral fibres to which a binder and optionally an anionic tenside is added following admix-

ture with the additive, is that a cohesive mineral fibre matrix is obtained wherein the additive is distributed. In this way a growing medium may be produced having high structural stability and properties preventing the sedimentation and/or washing out of the added particulate materials. Therefore the growing medium may be handled and shaped without loss of properties and, furthermore, it does not require further pretreatment prior to be taken into use by the consumer.

The cohesive mineral fibre matrix thus obtained may, after curing, be cut into boards of desired dimensions or into other shapes.

The growing medium according to the invention further provides a sterile growing medium thereby eliminating the risk of production loss due to the presence of weed and soil-borne diseases.

It is a further object of the invention to produce a plant growing medium which ensures that the potted plants have improved structural stability during transportation and longer shelf-lives at the retailers'.

The term 'mineral fibres' comprises fibres produced from i.a. minerals (rock wool fibres), slags (slag wool fibres) and glass (glass wool fibres). When granulated fibre material is used in the process according to the invention, it is preferred that the mineral fibre material is water-absorbent and has a volume weight of between 10 and 150 kg/m³. A cohesive mineral fibre matrix in this context consists of mineral fibres which are bounded to each other at points using a binder.

Preferably, the granulated expanded mineral used in the process according to the invention comprises comminuted, burnt and/or expanded clay, such as clay tiles, expanded perlite, etc., having a particle size of from 1 to 10 mm, preferably of from 2 to 8 mm, and a preferred weight by volume of from about 300 to about 600 kg/m³.

The expanded clay and granulated dried clay used in the growing medium according to the invention comprises natural clay, clay soil and clay minerals, such as montmorillonite, vermiculite, illite,

smectite, bentonite, caolinite, or moler or diacomaceous earth, preferably natural clay or clay soil having a montmorillonite content of more than 40 % by weight of the clay content, preferably having a volume weight of from 500 to 1500 kg/m³ and preferably a particle size of from 1 to 10 mm, more preferably of from 2 to 8 mm.

The binder used is preferably hydrophobic and preferably a polyphenol resin which has optionally been made water-absorbent by the addition of additives, such as an anionic tenside. Polystyrenes, polyurethanes and polyethylenes may also be used as a binder.

The preferred volume weight of the growing medium produced in the invention is from 75 to 200 kg/m³, preferably of from 100 to 160 kg/m³.

In a preferred growing medium according to the invention, the mineral fibre wool preferably constitutes from 20 to 50 % by weight, the expanded mineral constitutes from 20 to 40 % by weight, the dried clay constitutes from 30 to 50% % by weight and the binder constitutes from 0.01 to 10 % by weight and more preferably from 3 to 5 % by weight.

The addition of dried clay and expanded mineral to a mineral fibre wool having a volume weight of from 10 to 150 kg/m³ improves the water capacity and the water rentention properties in the range of from 0 cm suction pressure to -17.5 cm suction pressure relative to the requirements of a potted plant crop.

It has been found that when using the growing medium according to the invention the water capacity at 0 cm suction pressure may be lowered from about 90 % by volume in a purely mineral fibre matrix to less than 85 % by volume of water. Thereby the risk of overwatering of the growing medium is minimized. It has further been found that the water retention is improved so that the rate at which the water is released from total water capacity is reduced relative to a mineral fibre matrix of purely mineral fibres with the result that the risk of the medium drying out is reduced and the wilting point is moved to a higher suction pressure. Concurrently the air capacity at 0 cm suction pressure has been increased by 65% from 5.2

% by volume to 8.6 % by volume.

These factors render the growing medium according to the invention suitable for the transportation and shelving of potted plants at the retailers'.

Example 1 elucidates the above with regard to water capacity and water retention conditions.

The effect produced is probably due to the amended pore size distribution resulting from the large surface area of the additive material relative to its volume. A purely mineral, bonded fibre wool contains little but large pores whereas the growing medium produced according to the invention comprises a spectre of pore sizes where the mineral fibre wool contributes with large pores, the expanded mineral with medium pores and the dried clay also contributes with fine pores. This may be obtained partly as a consequence of the intrinsic properties of the expanded mineral and the dried clay, partly as a consequence of the preferred particle size of these materials, particles having a diameter of less than about 1 mm being less suitable as they emit dust during handling and are easily suspended. Particles having a diameter of more than 10 mm are also unsuitable, the space between them when packed being so wide that the capillary effect is broken. Figure 1 illustrates the difference in pore size distribution between a purely mineral fibre growing medium and a clay soil.

The addition of dried granulated clay, such as montmorillonite, illite, etc., having a relatively high cation exchange capacity (CEC) of from 15 to 100 meq/100 g material further imparts to the growing medium a reasonable fertilizer buffer which, in particular during transportation and on shelf, provides more healthy and more resistant plants thereby rendering the very accurate supply of fertilizer less imperative that was the case with a mineral fibre matrix consisting of purely mineral fibres.

It is well known that dried granulated natural clay retains up to 20% of the amount of plant nutrients added. Particularly phosphorus is bound which is illustrated by the below analysis example of rock

wool substrate having a volume weight of 120 g/l whereto is added about 30 % by weight of clay granulate. To the substrate about 20, 30 and 40 ppm of pure phosphorus have been added at least once a day during the period of from March 15 to May 7. In the substrate <u>Exacum affine</u> was grown.

<u>Table 1</u>

Phosphorus in substrate solution (ppm)

| | ppm of phosphorus in substrate solution | | |
|---|---|---|---|
| Added phosphorus ppm | March | April | May |
| 21.1 ppm | 0 | 0 | 0 |
| 29.4 ppn | 1 | 2 | 4 |
| 39.0 ppm | 5 | 9 | 18 |

On the basis of the test it is estimated that between 0.1 and 0.5 g of phosphorus is bound in the added clay during the crop period.

In order to avoid phosphorus deficiencies in the plants grown, it is thus crucial that phosphorus fertilizer is added to the dried granulated clay prior to use. This may preferably be effected with the use of triple phosphate or mono-ammonium phosphate in amounts corresponding to from 0.25 to 5.0 g/kg of clay, preferably from 0.5 to 2 g/kg of clay.

100 g of mineral fibre matrix produced according to the invention having a volume weight of about 140 to 160 kg/m³ and of a component distribution as follows: about 30 % by weight of mineral fibres, about 30 % by weight of dried clay (montmorillonite) and about 40 % by weight of expanded mineral, has a cation exchange capacity (CEC) of more than 30 meq/100 g mineral fibre matrix. A corresponding mineral fibre matrix consisting of purely mineral fibres has a CEC of less than 0.5 meq/100 g matrix and a typically used sphagnum-based plant growing medium has a CEC of from 30 to 80 meq/100 g of substrate.

Tests have shown that the collapse of the growing medium produced in the invention is less than 5% over a cultivation period of more than 3 months (0.5 l-pots, crop: Syngonium). Parallel tests of sphagnum-based products over the same period showed a collapse of more than 15% relative to the starting volume. The reduction of the collapse was further elucidated by the below results from an experiment comprising the addition of dried granulated clay and expanded clay mineral to sphagnum and rock wool.

Method:

A 50-50 % by weight mixture of dried clay granulate and expanded clay mineral was added to medium fine, non-fertilized sphagnum which was initially sieved through a 19 mm sieve thereby achieving a loose volume weight of 130 g/l. The addition of dried clay granulate and expanded clay mineral to sphagnum constitutes a total of 0, 5, 10, 20 and 40 % by weight of dried granulated clay. The samples were filled into 1-liter standard pots (12 C) and soaked. Prior to soaking it was ensured that the products levelled with the top edge of the pot. Following soaking the collapse in the pots was measured.

To compare the extent of collapse, bonded rock wool having a volume weight of 90-100 g/l whereto was added a 50-50 % by weight mixture of dried clay granulate and expanded clay mineral was used. The addition of dried clay granulate and clay mineral to the bonded rock wool constitutes a total of 0, 5, 10, 20 and 40 % by weight.

The collapse of the samples was measured again following 50 waterings following an ordinary ebb/flood watering scheme.

Table 2

Collapse after the first watering
(mm from pot top edge)

| Sample | 0 | 5 | 10 | 20 | 40 % by weight of additive |
|---|---|---|---|---|---|
| Sphagnum | 8 | 9 | 14 | 22 | 36 |
| Rock wool | 0 | 0 | <1 | <1 | <1 |

Table 3

Collapse after 50 waterings
(mm from pot top edge)

| Sample | 0 | 5 | 10 | 20 | 40 % by weight of additive |
|---|---|---|---|---|---|
| Sphagnum | 9 | 12 | 19 | 29 | 38 |
| Rock wool | 0 | <1 | <1 | <1 | <1 |

The growing medium produced according to the invention is preferably suitable for growing, transporting and shelving potted plants but the growing medium is also suitable for other uses, such a the growing of nursery stock plants in containers.

Example 1

A test series of growing media consisting of pure hydrophilic mineral fibre wool having three different volume weights and two growing media according to the invention was produced, the two latter consisting of hydrophilic mineral fibre wool having a volume weight of 50.7 and 57.1 kg/m³, respectively, whereto was added a

mixture of 50 % by weight of expanded clay having a particle size of from 1 to 4 mm and 50 % by weight of air dried granulated natural clay having a particle size of from 1 to 8 mm.

The test series was subjected to a water retention analysis and the results will appear from Table 4:

Table 4

Volume Weight and Volume % of Water Content in 5 Different Growing Media at Varying Suction Pressures

| Sample No. | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| Volume weight of mineral wool, $kg/m^3$ | 41.1 | 50.7 | 66.3 | 50.7 | 57.1 |
| Volume weight of additive, $kg/m^3$ | 0 | 0 | 0 | ab. 900 | ab. 900 |
| Total volume weight, $kg/m^3$ | 41.1 | 50.7 | 66.3 | 103.8 | 119.7 |
| Weight % additive | 0 | 0 | 0 | 49.8 | 57.1 |

| Volume % of water at suction pressure measured in cm water column: | | | | | |
|---|---|---|---|---|---|
| 0 | 89.9 | 92.3 | 89.0 | 87.7 | 87.0 |
| -5 | 60.0 | 68.0 | 76.0 | 78.5 | 79.6 |
| -12.5 | 28.7 | 30.9 | 35.0 | 41.9 | 45.3 |
| -17.5 | 10.7 | 15.6 | 16.0 | 19.6 | 23.1 |
| 0 | 29.0 | 36.0 | 50.0 | 49.9 | 57.3 |

It appears from Table 4 that the growing media according to the invention (Tests Nos 4 and 5) have improved water content at suction pressures within the range of from -5 to -17.5 cm water column thereby levelling out the wilting point. In particular test No. 5 with a total volume weight of 119.7 $kg/m^3$ has an indisputably higher water content at -17.5 cm water column than a purely mineral fibre medium. Furthermore, the water capacity (at 0 cm water column) is lower in Tests Nos 4 and 5 as compared to Tests Nos 1, 2 and 3 and consequently the air capacities of the products of Tests 4 and 5 are improved.

C l a i m s

1. Growing medium containing mineral fibres and granulated expanded mineral secured in a three-dimensional matrix with cured binder, c h a r a c t e r i z e d in that it comprises more than or equal to 30 % by weight of granulated dried clay and from 0.01 to 10 % by weight of binder.

2. Growing medium according to claim 1, c h a r a c t e r i z e d in that it comprises from 20 to 50 % by weight of mineral fibres, from 20 to 40 % by weight of expanded mineral and from 30 to 50 % by weight of dried clay and from 0.01 to 10 % by weight of a hydrophobic binder.

3. Growing medium according to claim 1 or 2, c h a r a c t e r i z e d in that the binder is selected from among polyphenol resins, polystyrenes, polyurethanes and polyethylenes.

4. Growing medium according to claims 1, 2 or 3, c h a r a c t e r i z e d in that its volume weight is from 75 to 200 kg/m³.

5. Growing medium according to claims 1, 2, 3 or 4, c h a r a c t e r i z e d in that the volume weight is from 100 to 160 kg/m³.

6. Growing medium according to any one of the preceding claims, c h a r a c t e r i z e d in that the mineral fibres comprise rock wool fibres, slag wool fibres and glass wool fibres.

7. Growing medium according to any one of the preceding claims, c h a r a c t e r i z e d in that the granulated expanded mineral comprises burnt and/or expanded clay, clay tiles or expanded perlite having a particle size of from 1 to 10 mm.

8. Growing medium according to claim 6, c h a r a c t e r i z e d in that the granulated expanded mineral comprises clay tiles having a particle size of from 2 to 8 mm.

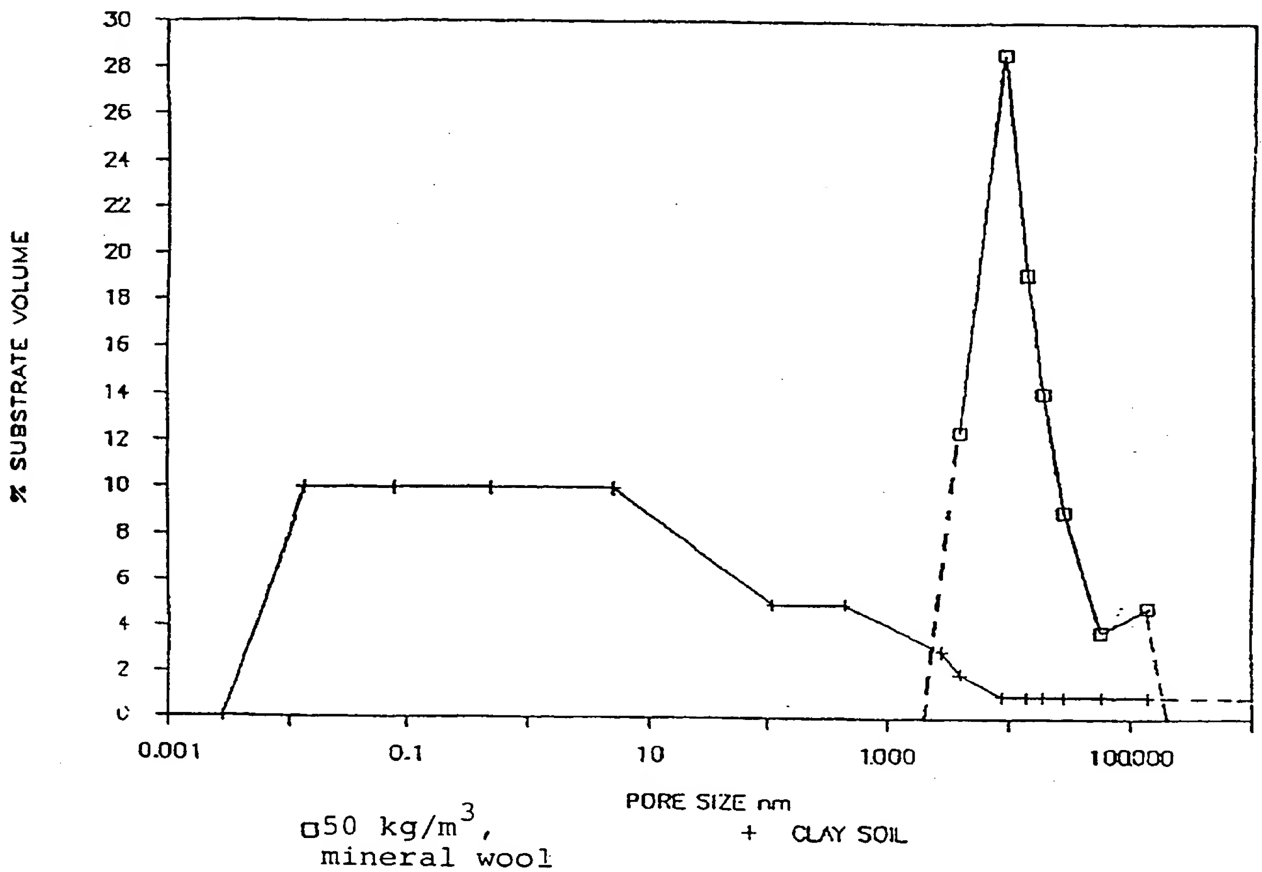
9. Growing medium according to claims 6-8, c h a r a c t e r i z e d in that the granulated dried clay comprises natural clay,

clay soil, montmorillonite, illite, vermiculite, smectite, bentonite, caolinite or moler or diatomaceous having a volume weight of from 500 to 1500 kg/m³.

10. Growing medium according to claim 9, c h a r a c t e r i z e d in that the granulated dried clay is natural clay or clay soil having a montmorillonite content of more than 40 % by weight of the clay content and a particle size of from 2 to 8 mm.

FIG. 1

PORE SIZE DISTRIBUTION



# INTERNATIONAL SEARCH REPORT

International Application No PCT/DK 92/00211

**I. CLASSIFICATI N OF SUBJECT MATTER** (if several classification symbols apply, indicate all)[6]

According to International Patent Classification (IPC) or to both National Classification and IPC

IPC5: A 01 G 31/00 //A 01 G 9/10

**II. FIELDS SEARCHED**

Minimum Documentation Searched[7]

| Classification System | Classification Symbols |
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| IPC5 | A 01 G; C 05 G; C 09 K |

Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in Fields Searched[8]

SE,DK,FI,NO classes as above

**III. DOCUMENTS CONSIDERED TO BE RELEVANT**[9]

| Category * | Citation of Document,[11] with indication, where appropriate, of the relevant passages [12] | Relevant to Claim No.[13] |
|---|---|---|
| X | EP, A2, 0156786 (DICALITE EUROPE-NORD) 2 October 1985, see page 5, line 23 - line 27; page 7, line 19 - line 21 | 1,4-8 |
| Y | | 1,2,3,9-10 |
| | -- | |
| Y | EP, A1, 0350132 (ROCKWOOL LAPINUS B.V.) 10 January 1990, see the whole document | 1,2,3,9-10 |
| | -- | |
| Y | WO, A1, 9108662 (ROCKWOOL INTERNATIONAL A/S) 27 June 1991, see claims 1,2,4,6,9 | 1-10 |
| | -- | |
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**IV. CERTIFICATION**

| Date of the Actual Completion of the International Search | Date of Mailing of this International Search Report |
|---|---|
| 21st October 1992 | 23 -10- 1992 |
| **International Searching Authority** | **Signature of Authorized Officer** |
| SWEDISH PATENT OFFICE | Ingrid Falk<br>Ingrdi Falk |

# ANNEX TO THE INTERNATIONAL SEARCH REPORT ON INTERNATIONAL PATENT APPLICATION NO.PCT/DK 92/00211

This annex lists the patent family members relating to the patent documents cited in the above-mentioned international search report.
The members are as contained in the Swedish Patent Office EDP file on 30/09/92
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| Patent document cited in search report | Publication date | Patent family member(s) | | Publication date |
|---|---|---|---|---|
| EP-A2- 0156786 | 85-10-02 | DE-A- | 3565203 | 88-11-03 |
| | | LU-A- | 85256 | 85-10-14 |
| EP-A1- 0350132 | 90-01-10 | EP-A- | 0498971 | 92-08-19 |
| | | JP-A- | 2079918 | 90-03-20 |
| | | NL-A- | 8801724 | 90-02-01 |
| WO-A1- 9108662 | 91-06-27 | AU-D- | 6904691 | 91-07-18 |
| | | EP-A- | 0504206 | 92-09-23 |